



Web based benchmarking tool for Labs21

Satish Kumar

Mayank Singh

Lawrence Berkeley National Laboratory

Overview

Motivation

Technology considerations

Tool demonstration

Motivation

Broad access

Central repository for data

Comparative Analysis

Visualization capabilities

Uniform format



Technology - Issues

Development time/Learning curve

Cost

Software

Support

Web server and database maintenance

Technology Comparative Analysis

Issues / Options	Development time	Cost	Admin. / Maintenance	Software
ASP MS Access IIS	High	High	High	Proprietary
JSP MySQL Apache	Medium	Low	Medium - High	Open Source
PHP MySQL Apache JpGraph	Low-Medium	Low	Low	Open Source
Cold-Fusion	Medium	High	High	Proprietary

Demonstration



Introduction



Step One - Login

Benchmarking Labs for the 21st Century Web Toolkit - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address <http://mac06.dc.lbl.gov/~singh/Labs21/StepOne.php> Go Google

LABS FOR THE 21ST CENTURY

benchmarking

Step One of Four - Login

Username

Password

Continue...

To request username and password, please email - [Paul Mathew \(pmathew@lbl.gov\)](mailto:pmathew@lbl.gov)

Last Updated - Wednesday, 11 September, 2002

Start



Step Two Add or Edit Facility

Benchmarking Labs for the 21st Century Web Toolkit - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address <http://mac06.dc.lbl.gov/~singh/Labs21/StepTwo.php> Go Google

LABS FOR THE 21ST CENTURY

benchmarking

Step Two of Four - Enter Facility Name and Year of Data

Welcome **Mayank Singh**
Organization Name - **Lawrence Berkeley National Laboratory**

Please choose the following

Facility name

Year for which data is being entered

Reset Values **Continue...**

The following facility data for your organization has been entered into the database

Facility Name	Year
Building200	2002
Building202	2002
Building205	2002
Building212	2002

Last Updated - Tuesday, 17 September, 2002

Start [Internet](#) [Benchmarking Labs fo...](#) [Macromedia Fireworks M...](#) [Labs21Present](#)



Step Three Facility Data

Benchmarking Labs for the 21st Century Web Toolkit - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address <http://mac06.dc.lbl.gov/~singh/Labs21/StepThreeP3> Go Google

LABS FOR THE 21ST CENTURY

benchmarking

Step Three of Four - Enter Data For The Facility

Required fields are in Red

Data / Facility Information

User	Mayank Singh
Lab name	Lawrence Berkeley National Laboratory
Facility chosen	Building202
Year chosen	2002

General Facility

Street Address	One Cyclotron Road
Location	Berkeley, CA
Zip Code (5 digit)	94720
Lab Use	Research/Development
Lab Type	Biological

Done Internet

Start Benchmarking Labs fo... Macromedia Fireworks MX Labs21Present



Step Three Facility Data

Benchmarking Labs for the 21st Century Web Toolkit - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address <http://mac06.dc.lbl.gov/~singh/Labs21/StepThreeP3> Go Google

Lab Category

Number of Building(s)

Gross Area (sq. ft.)

Lab Area (sq. ft.)
(Area requiring 100% outside air)

Weekday Occupancy Hours
(Normal occupancy hours e.g. 9hrs)

Year Built
(XXXX)

Energy Use

Annual Energy Utility Cost (\$)

Annual Heating Cost (therms)

Does facility use CHP (Cogen) system?

Annual Electric Use (kWh)

Total

Ventilation

Cooling Plant

Lighting

Process/plug

Peak Demand (kW)

Total

Done Internet

Start Benchmarking Labs fo... Macromedia Fireworks M... Labs21Present



Step Three Facility Data

Benchmarking Labs for the 21st Century Web Toolkit - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address <http://mac06.dc.lbl.gov/~singh/Labs21/StepThreeP3> Go Google

Ventilation

Cooling Plant

Lighting

Process/plug

System

Peak Cooling Load (Tons)

Average Cooling Load (Tons)
(Total annual cooling ton-hours divided by 8760)

Cooling Plant Capacity (Tons)

Peak CFM
(Sum of exhaust, supply, and recirculating fans)

Average CFM
(Sum of exhaust, supply, and recirculating fans)

HVAC Type
(Select dominant HVAC type)

Indoor Design Conditions

Occupied Cooling Setpoint (F)

Occupied Heating Setpoint (F)

UnOccupied Cooling Setpoint (F)

UnOccupied Heating Setpoint (F)

Done Internet

Start Benchmarking Labs fo... Macromedia Fireworks M... FireWorks-PNG



Step Three Facility Data

Benchmarking Labs for the 21st Century Web Toolkit - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address <http://mac06.dc.lbl.gov/~singh/Labs21/StepThreeP3> Go Google

High Performance Features

HVAC

<input type="checkbox"/> VAV Fumehoods	<input checked="" type="checkbox"/> VFD for Fans/Motors
<input type="checkbox"/> High Efficiency Chiller Plant	<input checked="" type="checkbox"/> High Efficiency Heating Plant
<input checked="" type="checkbox"/> Thermal Energy Storage	<input checked="" type="checkbox"/> Automated Control Systems
<input checked="" type="checkbox"/> Energy Recovery	<input checked="" type="checkbox"/> Low Pressure Air Distribution Design
<input type="checkbox"/> No Reheat	<input type="checkbox"/> Others

Lighting

<input checked="" type="checkbox"/> Daylighting System	<input type="checkbox"/> High efficiency lamps/fixtures
<input checked="" type="checkbox"/> Automated Controls	<input checked="" type="checkbox"/> Others

Envelope

<input checked="" type="checkbox"/> High Performance Glass	<input checked="" type="checkbox"/> External Shading Devices
<input type="checkbox"/> Others	

Others

☒ Other

Additional Comments

HVAC - Varies in Building, some wings upgraded most not.

Reset Values Continue...

Done Internet

Start Benchmarking Labs fo... Macromedia Fireworks M... FireWorks-PNG



Step Four Review Data

Benchmarking Labs for the 21st Century Web Toolkit - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address <http://mac06.dc.lbl.gov/~singh/Labs21/StepFourP3.p> Go Google

LABS FOR THE 21ST CENTURY

benchmarking

Step Four of Four - Review / Edit Entered Data

Data entered for the facility

User	Mayank Singh
Lab name	Lawrence Berkeley National Laboratory
Facility chosen	Building202
Year chosen	2002

General facility data fields

Street Address	One Cyclotron Road
Location	Berkeley, CA
Zip Code	94720
Lab Use	ResearchDevelopment
Lab Type	Biological
Lab Category	WetLab
Number of Buildings	1
Gross Area	217598

Done Internet

Start Benchmarking Labs fo... Macromedia Fireworks M... FireWorks-PNG



Step Four Review Data

Benchmarking Labs for the 21st Century Web Toolkit - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address <http://mac06.dc.lbl.gov/~singh/Labs21/StepFourP3.p> Go Google

High Performance Features

HVAC

VAV Fumehoods -	VFD for Fans/Motors - Yes
High Efficiency Chiller Plant -	High Efficiency Heating Plant - Yes
Thermal Energy Storage - Yes	Automated Control Systems - Yes
Energy Recovery - Yes	Low Pressure Air Distribution - Yes
No reheat -	Others -

Lighting

Day Lighting Systems -	High Efficiency Lamps/Fixtures -
High Efficiency Chiller Plant -	High Efficiency Heating Plant - Yes
Automated Controls - Yes	Others

Envelope

High Performance Glass - Yes	External Shading Devices - Yes
EnvelopeOthers -	Others - Yes
Additional Comments	HVAC - Varies in Building, some wings upgraded most not.

[Edit Data For This Facility](#)[Log out](#)

[Enter Data For Another Facility](#)[Comparative Analysis of Data](#)

Last Updated - Friday, 20 September, 2002

Done Internet

Start Benchmarking Labs fo... Macromedia Fireworks MX FireWorks-PNG



Metrics for Data Visualization

System	Energy Use Metrics	Efficiency Metrics
Ventilation	kWh/sf-yr	Peak W/cfm Peak cfm/sf (lab) Avg cfm/peak cfm
Cooling	kWh/sf-yr	Peak W/sf Avg kW/ton Peak tons/sf
Lighting	kWh/sf-yr	Peak W/sf
Process/Plug	kWh/sf-yr	Peak W/sf
Heating	BTU/sf-yr	Peak W/sf
Aggregate	kWh/sf-yr (total elec) BTU/sf-yr (source) BTU/sf-yr (site)	Utility \$/sf-yr Effectiveness (Ideal/Actual)

Metric and Filter Criteria

Benchmarking Labs for the 21st Century Web Toolkit - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address <http://mac06.dc.lbl.gov/~singh/Labs21/CompareData> Go Google

LABS FOR THE 21ST CENTURY

benchmarking

Choose Metrics and Filtering Criteria

Please specify the metric criteria -

System

Energy / Efficiency Metric

Please specify the filtering criteria -

1. Lab Area / Gross Area ratio
is greater than or equal to and is less than or equal to

2. Occupancy

☒ Standard (≤ 14 hours)

☐ High (> 14 hours)

☐ Both (all data)

3. Climate

☐ North East ☒ North West

☐ South East ☐ South West

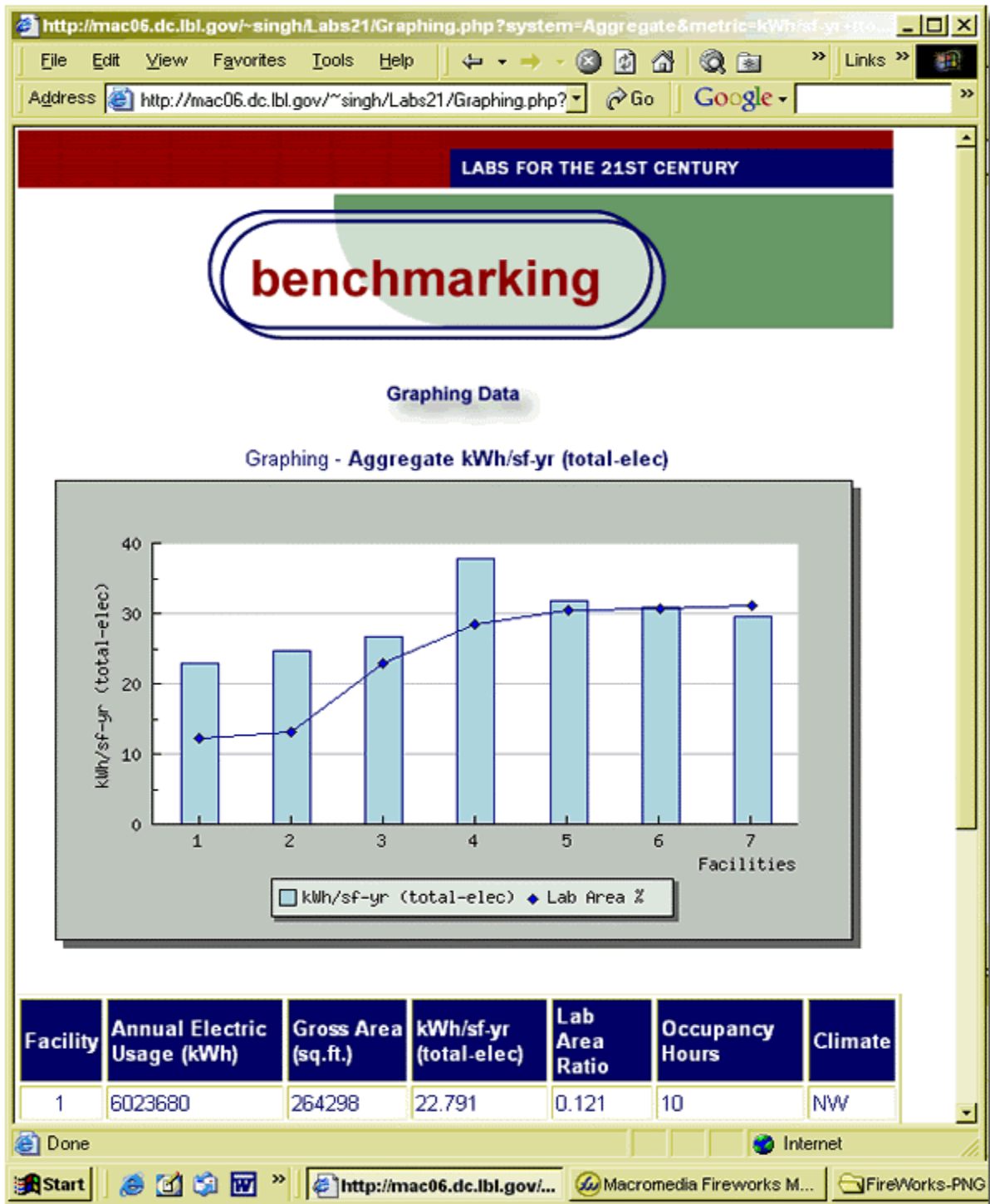
☐ Mid Atlantic ☐ Mountain

Done Internet

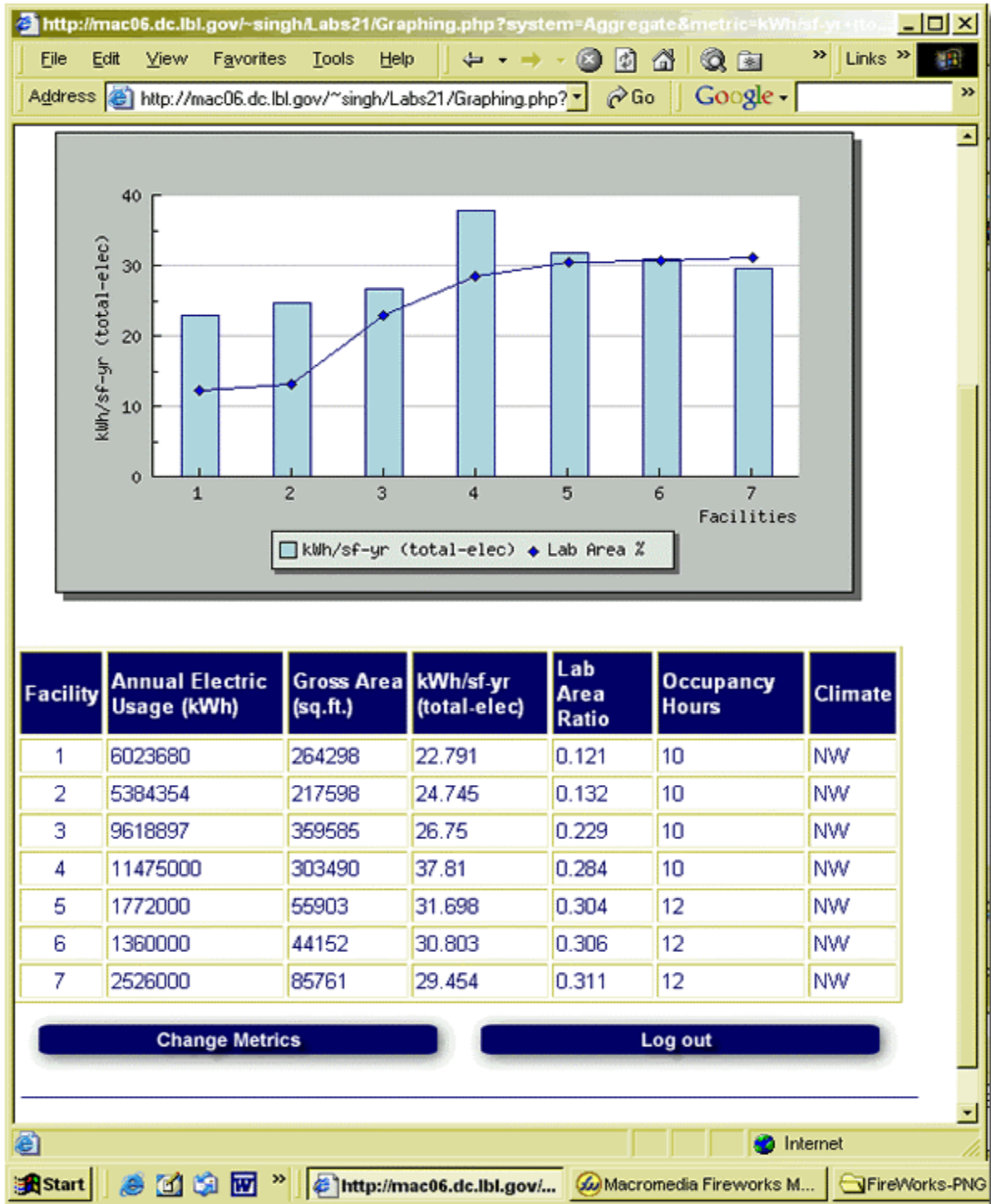
Start Benchmarking Labs fo... Macromedia Fireworks M... FireWorks-PNG



Visualizing Data



Visualizing Data



Next Steps

Launch test site: October 15th 2002

Pilot testing: Oct. 15th Dec. 15th

Expected final launch: Jan. 1st 2003.

